

nebula was found on the following evening in R.A. 18h. 4'3m. and Dec.  $-28^{\circ} 12'$ . Both, but particularly the first, are only minute, and can be with difficulty distinguished from stars, except by their spectra. The discovery was not the result of accident but of a search with a direct vision prism inserted between the objective and eyepiece of the 15-inch telescope. A star appears as a coloured line of light, while a planetary nebula forms a bright point, and is recognised instantly in sweeping. Many hundred or thousand stars can thus be examined very rapidly, and a single nebula picked out from among them. This method promises to add very greatly to the list of known planetary nebulae, which now number about fifty. Probably a systematic search for these objects crossing a considerable part of the heavens will be made at this Observatory. Our knowledge of that distribution will thus be greatly increased, and we shall know that their absence in certain parts of the sky is not due to an omission to look for them. Any planetary nebula as bright as a twelfth-magnitude star would probably be detected by the method proposed. Bright lines or other peculiarities in the stellar spectra will also be looked for.

Doubt has been thrown on many of the attempts to measure the parallax of planetary nebulae owing to the haziness of the borders of these bodies. The minuteness of the disks of the nebulae noted above could permit their positions to be determined with great precision, and would thus show a very minute parallax.

Cambridge, U.S., July 15 EDWARD C. PICKERING

### NOTES

AN influential committee has been formed from among the members in the Section of Zoology of the Paris Academy of Sciences and others eminent in that department, to obtain subscriptions for a medal in honour of M. Milne-Edwards, the *doyen* of French zoologists.

A MOVEMENT has been set on foot to obtain subscriptions to a memorial fund in honour of the late Rev. J. Clifton Ward, whose name must be well known to our readers as a working geologist who made valuable contributions to his science. Mr. Ward, moreover, did great service in promoting a love of science in Cumberland, and the Association for the Advancement of Literature and Science, for which he did so much, has taken the fund heartily up. It ought to receive many subscriptions outside of the Association, and we commend it to the liberality of our readers. Subscriptions should be sent to the Rev. Canon Battersby, St. John's Parsonage, Keswick, and to Mr. Edwin Jackson, hon. treasurer, Keswick Library and Scientific Society. It is proposed to expend the fund in the erection of a mural tablet in the church of St. John, Keswick, and the remainder in laying the foundation of a fund for the education of Mr. Ward's two daughters.

IN answer to a question in the House of Commons as to the cause of the delay in the removal of the Natural History Collection from the British Museum to South Kensington, and when that removal would be completed, Mr. Walpole said he believed the delay had been caused by the facts that the building in which the collection was to be placed was not handed over to the Trustees of the British Museum until June, and that the grant made by the Treasury was not sufficiently large to cover the whole estimated expense for the cost of the removal. He believed the removal of the mineralogical, geological, and botanical collection would be completed by the end of the year or in the spring of next year; and that as far as the zoological collection was concerned, its removal would depend very materially upon the grant which the Treasury might feel itself at liberty to make for the purpose.

PROF. ED. VAN BENEDEN is at present at Bergen for the purpose of working out the embryonic development of the Lemming,

which is likely to prove extremely interesting, because that of the guinea-pig is so abnormal.

A FEW months after Leverrier's death a commission was established for determining the best means of protecting collieries from fire-damp. The Commission has written a very long report recording the causes of 420 accidents. Sixty-four projects presented by private individuals have been examined, and some new instruments have been designed and are being constructed, viz., an anemometer by Vicaire, a manometer by Le Chatellier, and a registering apparatus for the quantity of air introduced into the galleries. But the composition of coal explosive dust has not been determined, nor the extent of its influence on catastrophes; the chemical analysis of Grisau has not been completed, and the salvage question has not been exhausted. The only substantial benefit is a compilation of mining regulations and a series of propositions which have been transmitted to the French Ministry, and will be laid before Parliament next session.

THE detailed programme of the annual meeting of the Iron and Steel Institute, to be held at Düsseldorf on August 25, 26, 27, and 28, is now published. The proceedings commence with a concert at the Tonhalle on Tuesday evening, August 24. On Wednesday there is to be in the morning a general meeting of members at the Tonhalle, where the institute will be received by the local authorities; in the afternoon a visit to the exhibition and to works near Düsseldorf; and in the evening the annual dinner of the institute at the Tonhalle. On Thursday and Friday there are to be general meetings in the morning for the reading and discussion of papers; the afternoons are to be devoted to excursions by special trains to various iron and steel works in the neighbourhood of Düsseldorf, followed by concerts in the evenings. The whole will be brought to a close by a Rhine excursion on Saturday, which is timed to bring members by 10.30 p.m. to Cologne, *via* Rolandseck, Bingen, and Coblenz. The general secretary is Mr. J. S. Jeans, whose address up till August 19 is 7, Westminster Chambers, Victoria Street; and after that date, Tonhalle, Düsseldorf.

THE Aldini gold medal (worth 1,000 lire) will be awarded by the Academy of Sciences of the Institute of Bologna to the best memoir on galvanism (animal electricity). Memoirs to be written in Italian, Latin, or French, and sent in before June 30, 1882.

THE Beneke prizes (first, 1,700 marks; second, 60 marks) of the Philosophical Faculty of Göttingen University are offered for investigation, theoretical and experimental, of diffraction phenomena in the case of non-homocentric light sources, as, especially, a circular and a square luminous surface of uniform brightness of the emitted simple or compound white light. Memoirs to be written in German, Latin, French, or English, and sent in before March 11, 1883.

A NEW process for obtaining stereotypes for printing has been discovered by M. Emile Jeannin, a sculptor of Paris, who proposes to employ for that purpose the material known as *celluloid*. The process of preparation takes only half an hour, when the types are once set up, and the plates thus produced are remarkably suitable for working on cylinder machines running at a high speed, being very light, flexible, and very durable. In this last respect indeed they surpass metal plates, affording, it is said, 50,000 impressions, whereas even an electrotyped copper plate backed with lead will only last for 30,000.

THE astronomical observatory established on the Trocadéro, is not the only scientific establishment which has found a home in the palace of the last Universal Exhibition. A number of microscopes have been arranged in a special room for the benefit of public instruction. The instruments lent by M. Joubert have been placed on the top of one of the towers, where a lift

has been arranged for helping visitors to find their way to this exalted situation.

A VERY curious telephonic experiment has been made in Switzerland on the occasion of the Federal *fête* of singers. A telephone had been placed in the Zürich Festhalle and two conductors connected with the Bâle telegraphic office, where a large audience had congregated. The distance from Bâle to Zürich is about 80 kilometres. The Bâle audience enjoyed the singing about as well as if they had been placed in the upper circle of an ordinary Opera House. At the end of the performance they proved their satisfaction by clapping hands, which the telegraphic wires transmitted with perfect fidelity to the Zürich performers.

A CREDIT of 25,000 francs has been voted by the French Parliament for establishing, on solid foundations, one signal at each extremity of the Melun base line, which was used by Delambre for measuring the distance from Dunkerque to Perpignan, and establishing the length of the metre. This operation was begun by Delambre and Laplace on 17 Vendémiaire, An VI. (October 1797) and terminated in six weeks. This base has a length of 6,000 toises, and was situated on the margin of a public road going from Lieusaint to the crossing of the Brie and Paris roads.

A STRONG shock of earthquake was felt at Smyrna at 5.10 a.m. on July 29. The walls of the telegraph office were split in two or three places. Four or five houses were thrown down, and many others were much damaged by the oscillation. Two of the inhabitants were killed, and five or six injured. Much damage has also been done in the country near Smyrna. At Burnabat the shock caused eleven houses and several cafés to fall in. Two minarets were also thrown down and two people were killed, and ten more or less injured. Slight shocks continued to be felt from time to time.

THE new edition of the "Guide to the Gardens of the Zoological Society" brings the notices of the tenants of the Gardens up to the latest date. Mr. Slater's name as editor of the Guide is a sufficient guarantee for its accuracy, while the numerous illustrations render it both attractive and instructive. By means of this very cheap Guide a visit to the Gardens will be rendered doubly enjoyable and profitable.

THE *Gardeners' Chronicle*, in advocating the establishment of school gardens where practicable, as an instrument of useful scientific education, refers to the success of such gardens in Bavaria, Belgium, Sweden, and other countries. In Sweden alone there are nearly 2,000 school gardens.

WE have received a copy of the *American Antiquarian*, No. 3, vol. ii., published at Chicago by Jameson and Morse, and edited by the Rev. S. D. Peet. It seems to us to be doing useful work in collecting information on early America, though several other serial publications in the States are doing the same thing to a greater or less extent. Excessive subdivision of labour of this kind in any special department is apt to embarrass the student.

THE subject of a depraved taste in animals is an interesting one, which has not been studied as much perhaps as it might. In human beings it would seem to depend on ill-health of either body or mind, but in animals it would seem as if it might be present and the animal enjoy good health. One remarkable instance in an herbivorous animal we can vouch for. It occurred in a sheep that had been shipped on board one of the P. and O. steamers to help to supply the kitchen on board, but while fattening it developed an inordinate taste for tobacco, which it would eat in any quantity that was given to it. It did not much care for cigars, and altogether objected to burnt ends; but it would greedily devour the half-chewed quid of a sailor or a

handful of roll tobacco. While chewing there was apparently no undue flow of saliva, and its taste was so peculiar that most of the passengers on board amused themselves by feeding it, to see for themselves if it were really so. As a consequence, though in fair condition, the cook was afraid to kill the sheep, believing that the mutton would have a flavour of tobacco. Another very remarkable case has just been communicated to us by Mr. Francis Goodlake: this time a flesh-eating animal in the shape of a kitten, about five months old, who shows a passionate fondness for salads. It eats no end of sliced cucumber dressed with vinegar, even when hot with cayenne pepper. After a little fencing it has eaten a piece of boiled beef with mustard. Its mother was at least once seen to eat a slice of cucumber which had salt, pepper, and vinegar on it. The kitten is apparently in good health, and its extraordinary taste is not easily accounted for. Even supposing it once got a feed of salmon mayonnaise, why should it now select to prefer the dressing to the fish?

THE *American Journal of Microscopy and Popular Science* (vol. iv., 1879, of which is before us) is now published monthly. Besides various original articles, some of which are illustrated, it contains from time to time abstracts of the transactions of many of the microscopical societies of the United States. This journal, without aiming at a standard to be compared with the European journals relating to microscopical science, seems to perform its part well, and we are glad to know that it has done much to encourage the use of the microscope in the States. We may trust soon to see some results from all this work, and to find the chief articles in the *American Journal of Microscopy* the result of original researches among the minute algæ, fungi, rhizopods and infusoria of America, and that the extracts from the various European journals may be relegated to a second place. There is without doubt an abundant field for work of this nature in America—witness Leidy's volume on rhizopods—nor do we understand why the labourers should be so few.

THE *Ceylon Observer* has published letters from Mr. Morris, who was recently transferred to the Botanical Gardens, Jamaica, detailing his recent experiences with regard to the cultivation of cinchona, and his views on the coffee-leaf disease in Ceylon. He still maintains the usefulness of dusting with lime and sulphur.

FURTHER rich discoveries of gold are reported to have been made in Northern Queensland and Tasmania. It is also stated that gold has been discovered under the basalt in the Brook Mountains, in New South Wales, the first instance of the kind in the colony.

IN a memoir published by the *Revue Scientifique*, M. Ernest Maindron, archivist of the Academy of Sciences, shows that the Academy is possessed of an income of 116,000 francs, to be awarded in about thirty prizes, of which the periodicity varies from one year to ten.

FROM the Fifth Annual Report of the Hertfordshire (formerly the Watford) Natural History Society, we are glad to learn that that society is now prosperous, its membership having greatly increased during the past year.

THE *Proceedings* of the Nottingham Literary and Philosophical Society for 1879-80 is mainly occupied with the president's (Rev. R. A. Armstrong) address on "What is Science?" papers on "Sandstones," by Mr. J. H. Jennings; "Philosophy in the Middle Ages," by Mr. G. B. Kidd; and "Structure of Molecules," by Mr. J. J. Harris Teall. A large number of lectures on scientific subjects were given during the session, and several special papers read in the Natural History Section.

THE *Transactions* of the Norfolk and Norwich Naturalists Society for 1879-80 contains a favourable report of the present



condition of the Society. The address of the president, Mr. T. Southwell, is on the Extinction of Native Races. Among other papers of interest are: "Notes on Collecting Lepidoptera in Norfolk, 1878," by Mr. F. D. Wheeler; "Discovery of Remains of *Emys lutaria* in the Mundesley River-bed," by Mr. H. B. Woodward; The Bird-Life and the Geology of the Shiant Isles, by Mr. Harvie-Brown and Prof. Heddle respectively; Notes on Hawking in Norfolk, by Prof. Newton and Mr. J. E. Harting; Ornithological Notes and Meteorological Observations.

THE *Proceedings* of the Liverpool Naturalists Field Club for 1879-80 contains notes of the excursions and meetings of the Society. The only papers given are by the president, the Rev. H. H. Higgins, one being "Biographical Sketches in Zoology, from its Origin to its Union with Botany in the Science of Biology."

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. J. Anson; a Side-Striped Jackal (*Canis lateralis*) from East Africa, presented by Commander Owen, R.M.S. *Anglian*; a Common Ocelot (*Felis pardalis*) from Mexico, presented by Mr. A. L. Schütte; two Common Peafowls (*Pavo cristata*) from India, presented by Mrs. Joseph Hoare; four Globose Curassows (*Crax globicera*), a Little Guan (*Ortalis motmot*) from British Honduras, presented by Mr. F. P. Barlee, C.M.G.; ten Amaduvade Finches (*Estrela amandava*) from India, presented by Mr. J. W. Wilson; a Mississippi Alligator (*Alligator mississippiensis*) from North America, presented by Mr. T. L. M. Rose; two Horrid Rattlesnakes (*Crotalus horridus*) from Nicaragua, presented by Messrs. Holt, Lord, and Co.; an Anaconda (*Eunectes murinus*) from South America, presented by Mr. G. H. Hawtayne; a Bonnet Monkey (*Macacus radiatus*) from India, an Arctic Fox (*Canis lagopus*) from the Arctic regions; a Nilotic Crocodile (*Crocodilus vulgaris*) from Africa, deposited; a Nylghaie (*Boselaphus pictus*) from India, a Collared Peccary (*Dicotyles tajacu*) from South America, two Common Otters (*Lutra vulgaris*, *ju.*), British; a Ground Hornbill (*Buccorvus albyssinicus*), an Elate Hornbill (*Buceros elatus*) from West Africa, a Virginian Eagle Owl (*Bubo virginianus*) from North America, a White-necked Crow (*Corvus scapularis*) from Africa, purchased; a Collared Fruit Bat (*Cynonycteris collaris*), born in the Gardens.

#### ON CURRENTS PRODUCED BY FRICTION BETWEEN CONDUCTING SUBSTANCES, AND ON A NEW FORM OF TELEPHONE RECEIVER<sup>1</sup>

IN a communication to the Royal Society of Edinburgh of date January 6, 1879, I showed that "electric currents were produced by the mere friction between conducting substances." The existence of these currents can be easily demonstrated either by a telephone or a Thomson's galvanometer. I have since found that these currents are, for all pairs of metals which I have yet tried, in the same direction as the thermo-electric current got by heating the junction of the same two metals. They are also, approximately at least, stronger in proportion as the metals rubbed are far apart on the thermo-electric scale—the strongest current, as far as I have yet observed, being got by rubbing antimony and bismuth together. These observations clearly point to a thermo-electric origin for the currents; but it is possible that they may be due partly to the currents suggested by Sir William Thomson as the cause of friction, and partly, also, to contact force between films of air or oxide adhering to the surfaces of the metals.

Having ascertained that these friction-currents are of some strength and fairly constant, I proceeded to make several kinds of machine for producing currents on this principle. One of them consists of a cylinder of antimony, which can be rotated rapidly, while a plate of bismuth is pressed hard against it by a

<sup>1</sup> Abstract of a paper read before the Royal Society of Edinburgh by James Blyth, M.A., F.R.S.E., on May 3, 1880.

stiff spring. When this machine is included in the same circuit with a microphone and a Bell telephone, the current got from it is quite sufficient to serve for the transmission of musical sounds and also loud speaking. The transmitter, which I have found most serviceable in my experiments, is made by screwing two small cubes of gas-carbon to a violin, and placing between them a long stick of carbon pointed at both ends, the points being made to rest in conical holes in the carbon cubes. The looseness of the contact is regulated by a paper spring. This forms an excellent and handy transmitter for all kinds of musical sounds, and also serves very well for transmitting speech.

Seeing that friction between metals clearly produces a current, it seemed natural to inquire if the converse held good, that is, if a current from a battery sent across the junction of two metals affected the friction of the one upon the other. I have tested for this in a variety of ways, and the results obtained leave me in doubt whether to attribute them to variations in the friction, or to actual sticking produced by fusion of the points of contact through which the current passes. The most noticeable effect is produced when one of the rubbing bodies is a mere point, and the other a smooth surface of metal. This led me to make a modification of the loud-speaking telephone of Mr. Edison, in order to get audible indications of changes of friction produced by the passing of a variable current. It consists of a cylinder of bismuth accurately turned and revolving on centres. The rubbing-point is made of a sewing-needle with its point bent at right angles, and its other end attached to the centre of the mica disk of a phonograph mouthpiece. It is evident that this is only a loose contact, which can be perpetually changed. When this apparatus is included in the circuit with the violin-microphone and three or four Bunsen cells, the violin sounds, as was to be expected, are heard proceeding from the loose contact, even when the cylinder is not rotated. They are increased, however, in a remarkable degree by rotating the cylinder slowly, so much so that a tune played on the violin can, with proper care, be distinctly heard all over an ordinary room.

With regard to the explanation of this effect, it is evident, that electrolysis can in no sense come into play, as is supposed to be the case in Edison's instrument. I am inclined to look for the explanation rather in the direction of the Trevelyan rocker, although the circumstances are considerably different in the two cases. In the rocker we have the heat passing from a mass of hot metal through two points of support to a cold block, whereas, in the other case, the heat is only intense at the points of contact, the rest of the metals being comparatively unaffected. The variations in the current produced by the transmitting microphone must cause corresponding variations in the heat at the point of contact of the needle with the cylinder, and this again produces a mechanical movement of the pressing point, as well as of the air surrounding it, sufficient to give forth sound-waves. If such be the case the effect should be different for different metals, those answering best which have the lowest thermal conductivity and also the lowest specific heat. That this is really so is shown by substituting cylinders of other metals for the bismuth, all other things remaining the same. In this way I have compared lead, tin, iron, copper, carbon, and find that they all give forth the simple loose contact-sound when the cylinder is stationary, but that it is only with bismuth that there is any very great intensification of the sound when the cylinder is rotated. Now, by consulting the appropriate tables I find that bismuth is a fraction lower than any other common metal in specific heat, while it is much below them all in thermal conductivity. This seems to bear out my explanation to a certain extent.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The subject for the Sedgwick Prize essay, 1883, is "The Classification of the Cambrian and Silurian Rocks." The prize is open to all graduates of the University of Cambridge who have resided sixty days during the twelve months preceding October 1, 1882. The essays must be sent in to the Registry on or before October 1, 1882.

#### SCIENTIFIC SERIALS

*Proceedings of the Academy of Natural Sciences of Philadelphia*. Part I, January to April.—Thomas Meehan, on disarticulating branches in Ampelopsis (the annual growth is dis-